



WETLAND RESTORATION AND CREATION

Conservation Practice Job Sheet

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Natural Resources Conservation Service (NRCS)

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INTRODUCTION

Wetlands are among the most biologically productive ecosystems in the world, and are vital to the survival of many animals and plants. Wetlands provide breeding, nesting, feeding, and resting habitat for waterfowl, wading birds, and other wildlife such as frogs, turtles, salamanders, muskrats, and aquatic insects. Wetlands can also provide important winter cover for pheasants and other upland wildlife.

Wetlands help improve water quality by intercepting surface runoff, trapping sediment, and processing nutrients and organic wastes before they reach open water. Many wetlands also store water temporarily, allowing the water to percolate slowly into the ground, evaporate, or be absorbed by the roots of wetland plants. This temporary storage reduces the peak water flows after a storm.

In Maryland, wetlands vary considerably in how "wet" they are during the year. Water may be present on the surface of some wetlands all year, while other wetlands will have surface water only during late winter and early spring. In some wetlands, surface water is rarely present, but the soil is saturated to the surface with groundwater for long periods.

Wetlands that are intended to provide wildlife habitat should be designed to provide water regimes that are suitable for the desired wildlife species. Wildlife utilize a wetland based on how deep the water is, when and how long the water remains on the site, and the food and cover that is available.

Plants that grow in wetlands (usually referred to "hydrophytic plants") provide food and cover for many species of wildlife. Seeds and rootstocks of these plants are important waterfowl foods. Their germination, growth, and availability for food are dependent on the water regime of the wetland.



Plants also serve as a food source for many smaller members of the animal community. When plants and plant debris are flooded and begin to deteriorate, they provide nutrients for many small aquatic animals. These small animals, such as snails, insects (especially caddis flies, beetles, true flies, and midges/bloodworms), crustaceans (fairy shrimp, clam shrimp, water fleas, scuds), and earthworms, provide a major food source for waterfowl and wading birds. They are an especially important food during protein-demanding periods such as egg-laying or molting.

Flooded wetland plants provide excellent resting and feeding areas for "puddle ducks" that "tip" to feed, such as mallard, widgeon, pintail, and teal. The optimum feeding depth for most of these ducks is 3 to 8 inches of water. In the spring, wetlands with shallow water areas (mud flats to 3 inches deep) are especially beneficial for shorebirds, such as plovers and sandpipers, on their northward migration. Canada geese will also feed in these shallow depths.

Land owners and managers please note: If you received cost-sharing for your wetland, be sure to check with your funding agency/organization for specific management requirements. Not all of the management options described in this job sheet may be allowed on your site.

OPTIONS FOR WETLAND RESTORATION AND CREATION

Wetland restoration is defined as restoring a drained or degraded wetland back to its original hydrologic condition and plant community, to the extent practicable. **Wetland creation** is defined as creating a wetland on a site where a wetland did not previously occur, or restoring a drained or degraded wetland to a wetland plant community or hydrology that is *different* from the original conditions.

Water levels and plants can be restored, created, and managed in various combinations to provide resting and feeding habitat for waterfowl, wading birds, frogs, turtles, and other wildlife. The type of wetland you choose to restore or create will depend primarily on the species of wildlife you want to attract, the location of your site, its soil type, the available water supply, how much time and/or money you are willing to spend, and any regulatory requirements or constraints of cost-sharing programs.

In general, at least 70% of the wetland must be restored or created to support a natural wetland plant community that will receive little or no management, so that it can provide all of the natural functions of a wetland. Up to 30% of the site can be restored or created to provide shallow open water and/or a periodically managed "moist-soil" area.

Water Considerations

Wetlands that have a variety of shallow water depths and soil moisture levels will support a diverse natural plant and wildlife community. During the growing season, water depths ranging from surface saturation to no more than 6 inches of water are usually best for plant growth. A few plant species will also grow in deeper water. Refer to Tables 2 and 3 for selected lists of native wetland plants and their water requirements.

Water levels can be managed by human actions, such as by adding or removing boards in a water control structure, or they can be allowed to vary naturally in response to seasonal changes in rainfall, groundwater levels, and evaporation rates. Many restored or created wetlands are completely dry in the summer, due to a lack of a permanent water supply.

Providing permanently or semi-permanently wet "frog holes" on at least 20% of the site will especially benefit resident wildlife such as ducks, geese, herons, frogs, toads, salamanders, and turtles that need a long-term water supply. Most amphibians, for example, need

semi-permanent water (at least until July) for egg-laying and tadpole development, while some need water year-round. Depending on the species, adult amphibians may spend most of their lives in shallow water or in adjacent upland forests and wet meadows.

Most aquatic wildlife need to spend some time resting, preening, or basking out of the water. Consider placing a few large tree branches and logs in the wetland to provide this type of habitat.

Plant Considerations

Wetlands may be restored or created to support trees, shrubs, sedges, rushes, or other native plant species. The different plant communities that grow in wetlands are dependent on the depth, duration, and seasonality of the water regime.

In Maryland, most wetlands that were converted to agricultural production (or other uses) were predominantly wooded wetlands. One option is to restore the natural wetland plant community that originally occurred on the site, or at least a much younger version of the original community.

Another option is to restore or create a wetland with a wetland plant community that is native to the geographic region, but not necessarily one that previously occurred on that site. For example, if you are primarily interested in providing habitat for waterfowl and wading birds, you will probably want a wetland that consists mostly of herbaceous plants that grow in shallow water. Along with the herbaceous vegetation, you may want to add small areas of shrubs and/or trees on parts of the site.

MANAGING RESTORED AND CREATED WETLANDS

Minimal management. If you do not want to actively manage water levels or plants on a regular basis, then nature will do it for you. The wetland will have a natural water regime in which water levels rise and fall seasonally in response to varying natural conditions, such as rainfall, groundwater levels, evaporation rates, etc. The water level may be managed occasionally if needed to control noxious weeds or invasive species, or to make structural repairs.

Plants on less managed herbaceous sites will tend to be perennials such as sedges, rushes, and many of the grasses. Perennial plants usually produce fewer seeds than annuals, but they can provide good year-round cover for wildlife resting, nesting, and rearing young.

In addition to seeds, the foliage and rootstocks of these plants can be eaten by waterfowl, wading birds, marsh birds, beavers, and muskrats.

Spot mowing or burning may be used if needed to reduce encroachment of woody vegetation into herbaceous wetlands. This maintenance should not occur more often than once every two to three years. Do not mow between April 15 and August 15 to avoid disturbing resident wildlife.

For wetlands areas that are intended to support trees and/or shrubs, mowing is generally not needed after the desired woody plants are well established. Maintenance plans may allow selective thinning of less desirable woody species (for example, sweetgum and red maple) to improve growing conditions for more desirable species such as oaks.

Do not fertilize the wetland. Natural wetland plants have low nutrient requirements, and do not need additional fertilizer. To the extent possible, do not use pesticides on the site to avoid harming wildlife that use the wetland. See page 7 for more information about controlling undesirable plants in wetlands.

Seasonal management for natural moist-soil plants.

Up to 30% of a restored or created wetland may be maintained as a periodically managed "moist-soil" area. Designated moist-soil management areas must have a fixed location within the wetland, and cannot be moved around from year to year.

Wild millet, rice cutgrass, smartweeds, sedges, rushes, and many other desirable plants can be encouraged through water level manipulations to germinate from existing seed sources in the soil, and produce an abundant source of high quality food for waterfowl. Drawdown (de-watering) of the area is necessary for germination of moist-soil plants. Annual plants produce the most seeds and provide an abundance of waterfowl food. Therefore, to maintain an area in early successional species (mostly annuals), and to control unwanted species, it is best to de-water and lightly disk the area every 3 years.

Consider the plant seeds that are likely to exist in the soil when determining whether you can manage for the plants you want. What plants have you seen growing on the site in previous years when you didn't intensively manage it? Seeds of those plants are probably still viable in the soil. The plant seeds available in the soil, and the timing and rate of the drawdown, will determine which plant species will grow in a restored or created wetland.

Slow drawdowns, over a period of 2 to 3 weeks, are usually more desirable for plant establishment and

wildlife use, and will reduce the amount of nutrients leaving the site (see Table 1). If you have a flashboard riser, pull one board and let the water drain down. After a few days, pull another board. Or, if you have a PVC standpipe with an elbow, tip it slightly to let just a few inches of water escape at a time. Slow drawdowns provide optimum conditions for germination of moist-soil plants, and result in the greatest quantity of seeds produced by those plants in late summer. In general, early slow drawdowns during April result in germination of smartweeds and sedges, while midseason drawdowns during May produce millets and beggarticks.

Table 1. Effects of fast vs. slow drawdowns on selected resource concerns (adapted from the Waterfowl Management Handbook, Fish and Wildlife Leaflet 13.4.6, 1991).

Resource Concern	Duration of Drawdown	
	Less than 4 days	More than 2 weeks
Time available for seed germination of moist-soil plants	Short	Long
Growth and seed production by moist-soil plants after April drawdown	Good	Excellent
Growth and seed production by moist-soil plants after May or June drawdown	Poor	Excellent
Cocklebur problems	High potential	Lower potential
Availability of snails, soil insects, and earthworms for waterfowl food	Low	High
Waterfowl use of the site during April drawdown	Good	Excellent
Waterfowl use of the site during May or June drawdown	Poor	Good
Nutrients leaving the site	High	Low

Shorebirds, such as plovers and sandpipers, feed on insects, small crustaceans, and earthworms in mud flats and in very shallow water (up to 3 inches) during the time of an early to midseason drawdown. Therefore, managed moist-soil areas can be a very important source of food for shorebirds during their spring migration.

After the moist-soil plants have produced seed in late summer or fall, re-flood the site slowly to coincide with the arrival of fall migrant waterfowl, usually September through November. Flooding the site slowly over a period of 2 to 3 weeks allows new areas of food to become available every day at the preferred water depth as the water is rising. Refer to Table 4 for

the water depths preferred by various waterfowl and wading birds.

Do not fertilize the managed moist-soil area or any other portions of the wetland. Natural wetland plants

have low nutrient requirements, and do not need additional fertilizer. To the extent possible, do not use pesticides on the site to avoid harming wildlife that use the wetland. See page 7 for more information about controlling undesirable plants in wetlands.

Table 2. Selected list of common herbaceous wetland plants, their water requirements, and food value for wildlife. These plants occur naturally in wet meadows and shallow marshes.

Common Name	Scientific Name	Plants Provide Food for: ^{1/}											
		Waterfowl	Marshbirds	Muskrats	Deer	Rabbits	Squirrels	Butterflies	Songbirds	Quail	Pheasants	Turkeys	Grouse
Water Regime: Surface Saturation to Infrequent Inundation													
Asters	<i>Aster</i> spp.				◆			◆	◆				◆
Boneset	<i>Eupatorium perfoliatum</i>							◆				◆	
Cardinal-flower	<i>Lobelia cardinalis</i>							◆					
Ironweed	<i>Vernonia noveboracensis</i>							◆					
Joe-Pye-Weed	<i>Eupatorium</i> spp.							◆	◆			◆	
Lobelia, Blue	<i>Lobelia siphilitica</i>				◆			◆					
Milkweed, Swamp	<i>Asclepias incarnata</i>							◆					
Monkey-Flowers	<i>Mimulus</i> spp.							◆					
Vervain, Blue	<i>Verbena hastata</i>							◆	◆				
Water Regime: Surface Saturation to +3 inches of Surface Water													
Cutgrass, Rice	<i>Leersia oryzoides</i>	◆	◆						◆			◆	
Iris, Blue	<i>Iris versicolor</i>			◆									
Manna-grasses	<i>Glyceria</i> spp.	◆		◆	◆				◆			◆	
Millet, Walter's	<i>Echinochloa walteri</i>	◆	◆						◆	◆	◆	◆	
Rush, Soft	<i>Juncus effusus</i>	◆		◆					◆				
Smartweeds	<i>Polygonum</i> spp.	◆	◆						◆	◆	◆		
Tearthumbs	<i>Polygonum</i> spp.	◆	◆						◆	◆	◆		
Water Regime: Surface Saturation to +6 inches of Surface Water													
Arrow-Arum	<i>Peltandra virginica</i>	◆	◆	◆									
Burreeds	<i>Sparganium</i> spp.	◆	◆	◆									
Bulrushes	<i>Scirpus</i> spp. (mostly)	◆	◆	◆					◆				
Sedges	<i>Carex</i> spp. (mostly)	◆	◆		◆				◆		◆	◆	◆
Spikerushes	<i>Eleocharis</i> spp.	◆	◆	◆									
Water Regime: Surface Saturation to +12 inches of Surface Water													
Arrowhead	<i>Sagittaria latifolia</i>	◆	◆	◆									
Cattails	<i>Typha</i> spp.	◆		◆									
Lizard's-tail	<i>Saururus cernuus</i>	◆						◆					
Pickereel-weed	<i>Pontederia cordata</i>	◆						◆					
Pond-lily, Yellow (Spatterdock)	<i>Nuphar lutea</i>	◆		◆									

Note: ^{1/} Depending on the animal's food preferences, wildlife may consume flowers, seeds, berries, nectar, stems, roots, or foliage from these plants.



Table 3. Selected list of common wetland trees and shrubs, and their food value for wildlife. These plants occur naturally in forested wetlands, shrub swamps, and on streambanks. Most wetland trees and shrubs prefer a water regime that ranges from surface saturation to infrequent inundation.

Common Name	Scientific Name	Plants Provide Food for: ^{1/}											
		Waterfowl	Marshbirds	Muskrats	Deer	Rabbits	Squirrels	Butterflies	Songbirds	Quail	Pheasants	Turkeys	Grouse
Trees													
Ash, Green	<i>Fraxinus pennsylvanica</i>	◆			◆		◆		◆	◆		◆	◆
Birch, River	<i>Betula nigra</i>	◆							◆				◆
Box-elder and Maples	<i>Acer</i> spp.				◆		◆		◆				◆
Cedar, Atlantic White	<i>Chamaecyparis thyoides</i>				◆				◆				
Cottonwood, Eastern	<i>Populus deltoides</i>				◆	◆	◆			◆			
Cypress, Bald	<i>Taxodium distichum</i>	◆	◆										
Gum, Black	<i>Nyssa sylvatica</i>				◆		◆		◆	◆		◆	
Gum, Sweet	<i>Liquidambar styraciflua</i>						◆		◆	◆			
Hemlock, Eastern	<i>Tsuga canadensis</i>				◆		◆		◆				
Holly, American	<i>Ilex opaca</i>						◆		◆			◆	
Magnolia, Sweetbay	<i>Magnolia virginiana</i>				◆		◆		◆				
Oaks	<i>Quercus</i> spp.	◆			◆		◆			◆	◆	◆	◆
Pine, Loblolly	<i>Pinus taeda</i>				◆	◆			◆	◆		◆	
Sycamore	<i>Platanus occidentalis</i>						◆		◆				
Willows	<i>Salix</i> spp.				◆	◆							◆
Shrubs													
Alders	<i>Alnus</i> spp.	◆			◆				◆	◆			
Arrowwood	<i>Viburnum dentatum</i>				◆	◆	◆		◆			◆	◆
Azalea, Swamp	<i>Rhododendron viscosum</i>				◆			◆					◆
Bayberry, Northern	<i>Myrica pensylvanica</i>				◆				◆	◆		◆	
Blueberry, Highbush	<i>Vaccinium corymbosum</i>				◆	◆	◆		◆			◆	
Buttonbush	<i>Cephalanthus occidentalis</i>	◆	◆		◆			◆					
Chokeberries	<i>Aronia</i> spp.				◆	◆	◆		◆				◆
Dogwoods	<i>Cornus</i> spp.				◆	◆	◆		◆	◆	◆	◆	◆
Elderberry	<i>Sambucus nigra</i> ssp. <i>canadensis</i>				◆	◆	◆		◆	◆	◆		◆
Fetterbush	<i>Leucothoe racemosa</i>				◆				◆				
Inkberry	<i>Ilex glabra</i>						◆		◆			◆	
Pepperbush, Sweet	<i>Clethra alnifolia</i>							◆					
Possum-haw	<i>Viburnum nudum</i>				◆	◆	◆		◆			◆	◆
Raisin, Wild	<i>Viburnum cassinoides</i>				◆	◆	◆		◆			◆	◆
Rose, Swamp	<i>Rosa palustris</i>				◆				◆				
Spicebush	<i>Lindera benzoin</i>								◆	◆			
Sweetspire, Virginia	<i>Itea virginica</i>							◆					
Waxmyrtle, Southern	<i>Myrica cerifera</i>				◆				◆	◆		◆	
Winterberry	<i>Ilex verticillata</i>				◆		◆		◆			◆	

Note: ^{1/} Depending on the animal's food preferences, wildlife may consume flowers, seeds, berries, nectar, stems, roots, or foliage from these plants.

Table 4. Timing and depths of water needed by migrating birds (○ - fall/spring migrants and winter residents), summer resident birds (●), and resident amphibians and turtles (●).

Wildlife Species	Preferred Surface Water Depths	Time of Year When Surface Water is Needed:												Remarks
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
Shorebirds (Yellowlegs, Sandpipers, and Plovers)	0* - 3 inches	○	○	○	○	○	○	○	○	○	○	●	●	Shorebirds are late summer, fall and spring migrants; winter residents. Statewide during migration; wintering mostly on the Coastal Plain. Very few species nest in Maryland.
Marshbirds (Rails and Snipe)	0* - 3 inches		○	○	○	○	○	○	○	●	●	●	●	Marshbirds are fall & spring migrants; winter residents. Statewide during migration; wintering mostly on the Coastal Plain. Some rails nest in Maryland, but snipe do not.
Geese	0* - 3 inches		○	○	○	○	○	○	○	●	●	●	●	Geese are fall & spring migrants; winter residents. Statewide during migration; wintering mostly on the Coastal Plain. Populations of permanent resident Canada geese also occur statewide.
Hérons (Little Blue, Green, Great Blue, and Night Herons)	1 - 4 inches	○	○	○	○	○	○	○	○	○	○	●	●	Hérons are fall & late spring migrants; some are winter residents. Statewide during migration; wintering mostly on the on the Coastal Plain. A few species nest in Maryland, in localized colonies. The Great Blue Heron can easily feed in water up to 12 inches deep.
Amphibians (Frogs, Toads, and Salamanders)	1 - 8 inches	●	●	●	●	●	●	●	●	●	●	●	●	Frogs and toads, and some salamanders, need areas of permanent shallow water for egg-laying and tadpole development, and to escape from predators. Eggs are usually laid in late winter to mid-summer. Tadpoles of most species develop into adults in less than 6 months (sometimes as little as one month), but other species need at least two years. Adults may live in the water or in adjacent upland buffers.
Turtles	1 - 20 inches	●	●	●	●	●	●	●	●	●	●	●	●	Aquatic turtles need areas of permanent shallow water for feeding and to escape from predators. Turtles lay their eggs in nearby uplands, and the young return to the water after hatching.
Dabbling Ducks (Wood Ducks, Mallards, Pintails, Gadwalls, Widgeon, Teal)	3 - 8 inches		○	○	○	○	○	○	○	○	○	●	●	These ducks are fall & spring migrants; some are winter residents. Wood ducks and mallards are found statewide, and nest in Maryland. Pintails, gadwalls, widgeon, and teal are found statewide during migration; wintering mostly on the Coastal Plain. They generally do not nest in Maryland.
Diving Ducks (Mergansers and Ruddy Ducks) and Coots	8 inches or more			●	●	●	●	●	●	●				These ducks and coots are fall & spring migrants; some are winter residents. Statewide during migration; wintering mostly on the Coastal Plain. Small populations of coots have reportedly nested on the lower Eastern Shore.

Note: *When there is 0 inches of surface water, then the soil needs to be saturated to the surface (mudflat) to provide suitable feeding habitat.

OTHER MANAGEMENT CONCERNS

Embankments and Water Control Structures

Inspect the condition of all inlet and outlet pipes and related structures. Remove trash or other obstructions that reduce the flow of water. Inspect berms and ditch plugs for evidence of erosion, burrowing by muskrats, or other structural problems. Repair or replace any damaged structures (e.g., berms, pipes, etc.). At a minimum, inspect the site at least once per year and after each major storm.

Buffers

Permanent vegetative buffers of grasses, wildflowers, shrubs, or trees can reduce the amount of sediment entering a wetland, and also provide additional food and cover for wildlife.

For grass buffers, you may need to spot mow or burn them infrequently (not more than once every two to three years) to reduce encroachment of trees and shrubs. To protect nesting wildlife, do not disturb buffers during the primary nesting season (April 15 to August 15).

Control of Undesirable Plants

Plants that are considered "undesirable" are those that tend to "take over" a site, to the exclusion of other plants. Undesirable plants in Maryland include cocklebur, reed canarygrass, phragmites (common reed), cattails, and all noxious weeds. These plants should be controlled by spot treatment, using mechanical methods or approved herbicides. Control of noxious weeds (specifically, Johnsongrass, shattercane, and various thistles) is required by state law.

The best approach for dealing with undesirable plants is to inspect your site periodically during the growing season and control undesirable invaders before they colonize a large area. Be especially alert if you have undesirable plants nearby that can readily seed into your wetland.

Once well-established, most undesirable plants are difficult to control. Cutting, burning, and herbicide applications can work, but you risk damaging desirable wetland plants, too. Removal by hand is a possible solution if the undesirable plants occupy only a small portion of the site. However, plants such as phragmites and cattails have extensive root systems, so digging out more than a few of these plants is difficult.

Water management techniques can sometimes be used to reduce problems with nuisance plants. Seeds of reed

canarygrass, phragmites, and cattails germinate best on moist soils, but not under several inches of water. Maintaining high water levels in the spring will help to discourage seed germination of these undesirable plants.

If woody vegetation is adjacent to a herbaceous wetland, it may be necessary to spot mow or burn the wetland infrequently (not more than once every two to three years) to discourage the growth of undesirable trees and shrubs.

For more information about controlling specific weeds, contact your local office of Maryland Cooperative Extension, or your local Maryland Department of Agriculture Weed Control Specialist.

Control of Undesirable Animals

Wetlands are intended to support wildlife, but some wildlife are less welcome than others. Beavers can significantly change a site's water regime and vegetation, and can cause structural failure by raising water levels above the intended design. They are difficult to discourage, and may need to be removed in accordance with state hunting and trapping regulations.

Muskrats can be beneficial because they control cattails and help maintain open water areas. However, muskrats can also cause structural failures by burrowing into berms. Burying chain link material into the berm immediately above and below the waterline can help to discourage their burrowing. Damage can also be minimized by designing berms with gentle slopes to the waterline (5:1), and with a shallow bench adjacent to the berm at the waterline. Muskrats seem to prefer steep banks to burrow in, with an approach that is safely under water. A few steep-bank islands in the water will provide habitat where muskrats can safely burrow. If necessary, muskrats may need to be removed from a site in accordance with state hunting and trapping regulations.

Geese can be discouraged by making the wetland and buffer less attractive to them. Geese generally prefer areas of open water and low vegetation for easy access into and out of the site. To discourage geese, design the site to minimize open water and favor the growth of tall, dense vegetation in the wetland. In the buffer, tall grasses, shrubs, and trees will be much less attractive to geese than a well-manicured area.

For more information about controlling nuisance animals, contact your local office of the Maryland Department of Natural Resources, Wildlife and Heritage Service.

Disturbances

Human activities in and around the wetland can have a significant impact on the behavior of wildlife. Disturbances cause water birds to move to other feeding grounds, and may lower productivity of nesting or brooding.

Loud activities conducted in or over the wetland cause the most disturbance, while quiet shoreline activities cause the least. Do not allow mechanized vehicles (e.g., mowing equipment or recreational vehicles) to enter the wetland or buffer area while waterfowl and wading birds are present. Consider establishing screened buffer zones to separate unavoidable disturbances (e.g., busy roads) from the site.

Do not allow livestock, dogs, or cats access to the site.

Promptly remove any trash, debris, or other materials which have entered the area. To the extent possible, do not allow sediment, chemical contaminants, or nutrients to enter the site.

Disease

Mass die-offs of waterfowl can occur at a particular site due to disease. Avian botulism is a common disease that occurs in wetlands that are frequented by large numbers of waterfowl. It can be rapidly transmitted from dead birds to healthy birds by infected maggots. Prompt removal and disposal of dead birds and fish can control the spread of the disease. Flooding designated moist-soil areas that have been dry for a long time, in summer when temperatures are high, is generally not recommended except for shorebird management. Under these conditions the bacterium that causes botulism can flourish.

SUGGESTED ADDITIONAL READING

Martin, Alexander C., Herbert S. Zim, and Arnold L. Nelson, 1951. *American Wildlife and Plants: A Guide to Wildlife Food Habits*. Dover Publications, New York. 500 pages.

Natural Resources Conservation Service, *Conservation Practice Standard for Wetland Restoration (Code 657)*, and *Wetland Creation (Code 658)*. Available free on the Internet at: <http://www.md.nrcs.usda.gov/>

U.S. Fish and Wildlife Service, Chesapeake Bay Field Office, with the Natural Science Center and Adkins Arboretum, 1995. *Native Plants for Wildlife Habitat*. Annapolis, MD.

U.S. Fish and Wildlife Service, *Waterfowl Management Handbook*. This is a collection of fact sheets with detailed information about various waterfowl management topics. It was written primarily for the mid-western states, but much of the information is also applicable for the mid-Atlantic. Available free on the Internet at: <http://www.mesc.usgs.gov/>

University of Maryland, Cooperative Extension, *Wildlife Management Fact Sheet Series*. This is a collection of fact sheets not only about managing for waterfowl, but also for rabbits, quail, pheasants, squirrels, songbirds, and other wildlife. Available at a nominal cost from county offices of Maryland Cooperative Extension.



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WETLAND MANAGEMENT SCHEDULE

Name:		Farm/Tract:	
Field:	Wetland Unit:	Assisted by:	Date:

The wetland will be managed to provide habitat for the following wildlife: (check all that apply)

☐ Dabbling ducks
 ☐ Geese
 ☐ Sandpipers, plovers, etc.
 ☐ Herons
 ☐ Others _____

Management Activities Needed on All Sites

- Inspect all embankments and structures at least once per year and after every major storm. Promptly remove trash and obstructions, fix leaks, and make other repairs as needed.
- On grassy buffers and embankments, and in wetland areas that are designed to remain herbaceous, spot mow or burn infrequently (not more than once every two to three years) if needed to reduce encroachment of trees and shrubs. Do not mow or burn between April 15 and August 15, to protect ground-nesting wildlife.
- Control noxious weeds and other invasive plants by spot treatment, using mechanical methods or approved herbicides. Control of noxious weeds (specifically, Johnsongrass, Shattercane, Canada Thistle, Bull Thistle, Plumeless Thistle, and Musk Thistle) is required by state law.
- Nuisance animals such as beavers and muskrats may be removed in accordance with state game regulations.
- Planting of annual food plots is not permitted.

Designated Moist-Soil Management Area
☐ Will be used
☐ Is optional
☐ Will not be used

- Slow drawdown (2 - 3 weeks, or longer) starting on or about: _____
- Drawdown should end approximately: _____
- OR Allow the site to naturally de-water as rainfall decreases over the summer.
- Leave most of the designated moist-soil area drained over the summer for natural wetland plants to grow.
- Allow the moist-soil area to gradually refill as waterfowl begin to migrate, starting: _____
- Maintain the active feeding area _____ inches deep while waterfowl are using the site. Leave the site flooded through the winter.
- Every three years, lightly disk the designated moist-soil area at the start of the growing season (after drawdown) to encourage growth of annual naturally-occurring herbaceous wetland plants. If undesirable plants become established, disk 2 or 3 times by mid-summer, then immediately flood (if possible) until the following spring.
- If perennial grasses, sedges, and rushes are preferred, then do not disk the moist-soil area. If needed, spot mow or burn occasionally to reduce encroachment of trees and shrubs, as described above.
- Do not fertilize the moist-soil area or any other part of the wetland. Natural wetland plants have low nutrient requirements, and do not need additional fertilizer.

Additional Recommendations: